

July 12, 2004

Mr. David Lochbaum  
Nuclear Safety Engineer  
Union of Concerned Scientists  
1707 H Street NW, Suite 600  
Washington, DC 20006-3919

Dear Mr. Lochbaum:

I am responding to your letter dated March 12, 2004, to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you expressed concerns regarding the NRC's review process for the proposed power uprate at the Vermont Yankee Nuclear Power Station (Vermont Yankee). Specifically, you stated that safety cannot be adequately assured by the NRC without an independent safety assessment. You stated your position was based on your belief that: (1) Vermont Yankee has not undergone a rigorous system review in the past 20 years; (2) the Reactor Oversight Process (ROP) is currently significantly impaired; and (3) the review process for extended power uprate license amendments is currently impaired. These three issues are addressed in Enclosure 1 to this letter.

On May 4, 2004, the NRC sent a letter to the Vermont Public Service Board (PSB) responding to the PSB's request for an independent engineering assessment at Vermont Yankee. A copy of the letter (Enclosure 2) is provided for your information. As described in the enclosed letter, the NRC will conduct a detailed engineering inspection at Vermont Yankee. The inspection will be done as part of a new engineering inspection that the NRC has been developing to enhance the ROP.

As you are aware, the NRC staff's review of the Vermont Yankee power uprate amendment request is not yet complete. As such, we have not reached any conclusions concerning the acceptability of the proposed amendment. We believe that the extensive technical review performed by the NRC staff using our new Review Standard for extended power uprates, combined with the inspections prescribed by the ROP, as enhanced by the new engineering inspection, will provide the information necessary for the NRC staff to make a decision on whether Vermont Yankee can operate safely under uprated power conditions. The NRC will not approve the Vermont Yankee power uprate, or any proposed change to a plant license, unless the NRC staff can conclude that the proposed change will be executed in a manner that assures the public's health and safety.

D. Lochbaum

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I hope this information is useful in addressing your concerns. Additional information regarding the Vermont Yankee power uprate review is available on the NRC Web site at:  
<http://www.nrc.gov/reactors/plant-specific-items/vermont-yankee-issues.html>.

Sincerely,

***/RA/***

J. E. Dyer, Director  
Office of Nuclear Reactor Regulation

Enclosures: As stated

D. Lochbaum

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**/RA/**

J. E. Dyer, Director  
Office of Nuclear Reactor Regulation

Enclosures: As stated

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Response: ML041530029

Letter to PSB: ML041170438

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ISSUES RELATED TO THE POWER UPRATE REVIEW PROCESS  
FOR  
VERMONT YANKEE NUCLEAR POWER STATION (VERMONT YANKEE)

The following information is provided to address issues raised in the March 12, 2004, letter from Mr. David Lochbaum, Union of Concerned Scientists (UCS), to the U.S. Nuclear Regulatory Commission (NRC). The letter expressed concerns regarding the NRC's review process for the proposed extended power uprate (EPU) at Vermont Yankee.

Vermont Yankee System Reviews

The UCS letter stated that unlike many other Region I reactors (Pilgrim, Peach Bottom Units 2 and 3, Calvert Cliff Units 1 and 2, Nine Mile Point Unit 1, Millstone Units 2 and 3, Indian Point Unit 3, FitzPatrick, and Salem Units 1 and 2), Vermont Yankee has not undergone a rigorous system review in the past 20 years.

The Region I reactors listed by the UCS letter were facilities that had a documented history of performance problems or significant operational events. The kinds of problems or operational events that required an increase in the level of NRC review for those facilities have not been observed at Vermont Yankee. Notwithstanding and contrary to the UCS's assertion, Vermont Yankee has undergone rigorous system reviews. Since 1997, six team inspections have been conducted that have inspected the engineering aspects of many systems and components at Vermont Yankee. In 1997, the NRC performed an Architect-Engineer team inspection at Vermont Yankee to evaluate the capability of selected systems to perform the safety functions required by the design bases, the adherence of the systems to their design and licensing bases, and the consistency of the as-built configuration and system operations with the Final Safety Analysis Report. This inspection consisted of six independent contractors and leadership from our NRC headquarters staff. Later in 1997, a four-member NRC team followed-up on the findings of the Architect-Engineer inspection. In 1998, the NRC conducted an eight person engineering team inspection to address operability issues resulting from Vermont Yankee's configuration improvement program. Also in 1998, a four member team conducted the routine engineering core inspection program. Since 2000, the NRC has conducted two safety system design and performance capability inspections, with each inspection consisting of six inspectors. Although our inspections concluded that Vermont Yankee's activities in this area have been rigorous, our inspections did have findings that were subsequently corrected by the Vermont Yankee staff. Our Reactor Oversight Process (ROP) has clear criteria for evaluating the inspection results for a facility to determine whether we need to escalate the level and depth of inspections. We have not and will not hesitate to escalate our inspection activities when conditions call for such action.

In addition to the extensive technical review performed by the NRC headquarters staff using our new Review Standard for EPUs, on-site inspections will be performed as part of the recently established EPU review process. NRC inspections will review selected activities and modifications made to allow operation at higher power levels to verify that changes to plant systems will support safe plant operation and are in accordance with Vermont Yankee's licensing and design bases. The NRC will use Inspection Procedure 71004, "Power Uprates," as well as a number of our baseline inspection procedures to inspect issues specifically related

to the power uprate. Additionally, our other baseline inspection activities will provide additional information about Vermont Yankee's ability to operate safely at a higher power level.

The NRC has taken a closer look at our proposed inspections and technical reviews to assure ourselves that they will identify any potential concerns for operating at uprated power conditions. As described in our letter to the Vermont Public Service Board dated May 4, 2004 (see Enclosure 2), the NRC will conduct a detailed engineering inspection at Vermont Yankee. The inspection will be performed as part of a new engineering inspection that the NRC has been developing to enhance the ROP. This new engineering inspection incorporates the best practices of existing and past engineering inspections. The NRC will use this inspection to verify that design bases have been correctly implemented for a sampling of components across multiple systems and to identify latent design issues. The inspection process uses operating experience, risk assessment, and engineering analysis to select risk-significant components and operator actions, and will ensure that adequate safety margins exist. Although the specific sampling of components is still being developed, it will include components from multiple systems that are potentially affected by a power uprate such as the emergency core cooling systems, the containment system, power conversion systems, and auxiliary systems. Three weeks of on-site inspection and over 700 hours of direct inspection time will be conducted. This level of effort exceeds that of the biennial safety system design inspection.

The inspection team will consist of seven members including: a team leader, three contractors with design experience, and three experienced NRC inspectors. An observer from the State of Vermont will also accompany the team. To ensure the independence of the team, the contractors to be selected must have: (1) never been directly employed by Entergy or Vermont Yankee; (2) not performed contract work for Vermont Yankee or Entergy within the last two years; and (3) not performed inspections for the NRC at Vermont Yankee within the last two years. The NRC inspectors will not be current or former resident inspectors at Vermont Yankee or have participated in an engineering inspection at Vermont Yankee within the last two years.

We believe that the extensive technical review performed by the NRC staff using our new Review Standard for EPU's, combined with the inspections prescribed by the ROP, as enhanced by the new engineering inspection, will provide the information necessary for the NRC staff to make a decision on whether Vermont Yankee can operate safely under uprated power conditions.

#### NRC's ROP

The UCS letter stated that the NRC's ROP is currently significantly impaired, as evidenced by the failure of the process to identify problems at the Davis-Besse nuclear plant related to corrosion of the reactor vessel head.

As described in the Davis-Besse Lessons Learned Task Force (LLTF) report, the corrosion of the reactor vessel head at Davis-Besse existed under both the former inspection process and the current ROP. The aggressiveness of this corrosion was previously not recognized by the inspectors, technical staff, or industry. This is one reason why NRC requirements incorporate a defense-in-depth philosophy. Inspections sample the various layers of this defense-in-depth to assure it remains in place.

However, in light of the event at Davis-Besse, the Davis-Besse LLTF performed a comprehensive review of NRC's processes. One of the focal points of that review was the implementation and effectiveness of the inspection program at Davis-Besse. Although we continue to believe that the ROP is fundamentally sound, it was clear from Davis-Besse that we needed to learn from the Davis-Besse experience.

The LLTF recommended several changes to a broad scope of NRC activities including enhancements to the inspection program. NRC senior management reviewed the recommendations and accepted 49 of the 51 recommendations for NRC action and ranked them as high, medium, or low priority. The NRC staff has made significant progress in implementing these recommendations and expects completion of more than 70 percent of them, on a prioritized basis, by the end of calendar year 2004.

One of the key changes was to reinforce awareness of the importance of the NRC maintaining a questioning attitude regarding potential safety issues. There has been increased emphasis on inspector review of out-of-specification conditions and on aggressive followup to issues. We will continue to look for ways to learn from our experience to provide continued assurance of public health and safety.

#### EPU License Amendment Review Process

The UCS letter stated that the NRC's EPU license amendment review process is currently impaired, as evidenced by: (1) significant events caused by vibration at boiling water reactors (BWRs) that were operating at EPU conditions; and (2) the NRC's Safety Evaluation (SE) for the Brunswick EPU amendment not addressing guidance in Regulatory Guide (RG) 1.82.

The NRC staff is using the guidance issued in December 2003 to review the Vermont Yankee power uprate request (NRC Review Standard RS-001, Revision 0, "Review Standard for Extended Power Uprates"). The Vermont Yankee EPU review is the first use of RS-001. The Review Standard is available on the NRC Web site at:  
<http://www.nrc.gov/reactors/operating/licensing/power-uprates.html>.

The NRC shares the UCS concern regarding vibration at BWRs that were operating at EPU conditions (i.e., steam dryer cracking and flow-induced vibration damage to other components). This issue is discussed in NRC Information Notice (IN) 2002-26, "Failure of Steam Dryer Cover Plate After a Recent Power Uprate," dated September 11, 2002, (available electronically from the NRC's Agencywide Documents Access and Management System (ADAMS) using Accession No. ML022530291); IN 2002-26, Supplement 1, "Additional Failure of Steam Dryer After a Recent Power Uprate," dated July 21, 2003 (ADAMS Accession No. ML031980434); and IN 2002-26, Supplement 2, "Additional Flow-Induced Vibration Failures After a Recent Power Uprate," dated January 9, 2004 (ADAMS Accession No. ML040080392).

As discussed in IN 2002-26, Supplement 2, the NRC staff is reviewing plant-specific and industry-wide activities to address the potential for flow-induced vibration damage to steam dryers and other plant components in BWR plants operating or planning to operate at conditions above the original licensed thermal power (OLTP) level. Although the steam dryer does not perform a safety-related function, it must retain its structural integrity to avoid loose dryer parts from entering the reactor vessel or steam lines and adversely affecting plant operation. It is important to understand the extent of damage that might be caused by steam

dryer failures and to identify the lessons-learned from recent steam dryer failures for application to steam dryers at other BWR plants. It is also important to address the potential for similar failures in other plant components in BWR or pressurized water reactor (PWR) plants operating or planning to operate at conditions above the OLTP level.

The lessons-learned from these events are being applied to our review of subsequent power uprates, including the proposed Vermont Yankee power uprate. On May 28, 2004, the NRC issued a request for additional information (RAI) (ADAMS Accession No. ML041450020) to Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) concerning the proposed Vermont Yankee EPU amendment. The RAI included numerous questions regarding steam dryer integrity and flow-induced vibration based on these lessons-learned. The cover letter for the RAI highlighted the significance of steam dryer integrity and stated that the NRC needs to fully understand the analysis, design, and monitoring that Entergy plans for the Vermont Yankee steam dryer as part of our evaluation of the power uprate request.

With respect to the Brunswick EPU amendment, the UCS letter cited guidance in RG 1.82, Revision 3, which states, in part, that credit for containment accident pressure, for calculating the available net positive suction head (NPSH) of the emergency core cooling system (ECCS) and containment heat removal pumps, should be minimized to the extent possible. The UCS letter stated that the NRC's SE for the Brunswick EPU amendment failed to discuss RG 1.82 and how credit for containment accident pressure was being minimized to the extent possible.

The NRC's guidance regarding whether it is acceptable to credit containment accident pressure has evolved over the years. The current guidance is contained in RG 1.82, Revision 3, "Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant Accident" dated November 2003. RG 1.82, Revision 3, page 2 states, in part, that:

This regulatory guide has also been revised to include guidance previously provided in Regulatory Guide 1.1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps." The provisions of Regulatory Guide 1.1 have been updated in this guide to reflect the results of the NRC's review of responses to Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," dated October 7, 1997.

Based on review of your letter, and a letter from the State of Vermont dated December 8, 2003 (ADAMS Accession No. ML033450299), the NRC staff has discussed the need for more clarity in the guidance on credit for containment accident pressure. RG 1.82 does not clearly explain what is meant by the phrase "minimized to the extent possible" as discussed in the general discussion section of the RG. The specific guidance related to credit for containment accident pressure is contained in RG 1.82, Revision 3, Regulatory Position C.1.3.1.2 (for PWRs) and Regulatory Position C.2.1.1.2 (for BWRs). The guidance describes conservative assumptions for determining the available NPSH including underestimating the available containment pressure and overestimating the suppression pool water temperature.

In addition, we realize that the fact that we did not formally withdraw RG 1.1, which did not allow credit for containment accident pressure, has led to confusion about our technical position. We will both formally withdraw RG 1.1, since it has been superceded, and revise RG 1.82 to more clearly explain how credit for containment accident pressure can be found acceptable. In

addition, the staff plans to update Standard Review Plan 6.2.2, "Containment Heat Removal Systems," to reference the latest revision of RG 1.82, and to delete references to RG 1.1.

The Brunswick EPU amendment was issued by the NRC on May 31, 2002. Although the Brunswick review was performed prior to the issuance of RG 1.82, Revision 3, the NRC staff assured that the Brunswick NPSH calculation conservatively underestimated the available containment pressure and overestimated the suppression pool water temperature to ensure adequate safety margins remained at the proposed power level. The effects of the EPU on NPSH are evaluated in Section 4.2.5 of the Brunswick SE (ADAMS Accession No. ML021440346). An example of the conservative assumptions used in the Brunswick NPSH calculation is the assumption that containment sprays would be operating. This results in a calculated available post-accident pressure that is lower than if the sprays were not operating. As discussed in the SE, without the containment sprays operating, the available post-accident containment pressure was calculated to be 25.5 psig. With the sprays operating, the available post-accident containment pressure was calculated to be 11.3 psig. The licensee only credited 5.0 psig of the 11.3 psig of available containment pressure.

The Vermont Yankee EPU amendment request is being reviewed by the NRC staff using the guidance in RG 1.82, Revision 3. The staff's RAI dated May 28, 2004, to Entergy concerning the proposed Vermont Yankee EPU amendment includes numerous questions regarding the proposed crediting of containment accident pressure. The NRC staff has not reached any conclusions regarding the acceptability of the proposed amendment.